JOIV : Int. J. Inform. Visualization, 5(4) - December 2021 372-379

INTERNATIONAL JOURNAL ON INFORMATICS VISUALIZATION

journal homepage : www.joiv.org/index.php/joiv

Group Decision Support System Using AHP, Topsis and Borda Methods for Loan Determination in Cooperatives

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***Abstract*— Cooperatives are one of the business units which purpose is to help the economy of small and medium-sized communities. One of the cooperatives in the city of Padang, West Sumatra, Indonesia is KPN Kapur Warna. The routine business unit managed by KPN Kapur Warna is for savings and loans. So far, the savings and loan process is still done manually, including determining the eligibility of members to receive loans. Determination of the eligibility of members is carried out less objectively, by only looking at the profile of participants in general and the decision-making process is only carried out by one person, namely the chairman of the cooperative. The process that has been carried out so far has often resulted in wrong targets, namely providing loans to members who are not appropriate, resulting in bad credit or delays in paying monthly installments of participants. Therefore, we need a group decision support system that can help solve the above problems. In this study, a group decision support system was made using the AHP, TOPSIS and BORDA methods using five main criteria. The AHP method is used to determine the priority value for each criterion and the TOPSIS method is used to rank each alternative. Each decision maker performs the same process with the two methods, and then voting is carried out using the BORDA method of combining assessments for different decision makers. This study succeeded in providing a reference in determining the eligibility of which members are entitled to receive loans from cooperatives, with results that are more subjective and can help cooperatives in their work efficiently.**

***Keywords*—AHP; BORDA; cooperative; GDSS; loan; TOPSIS.**

Manuscript received 15 Apr. 2021; revised 19 Nov. 2021; accepted 3 Dec. 2021. Date of publication 31 Dec. 2021.

I. INTRODUCTION

Cooperatives are growing rapidly in Indonesia. Since cooperatives were first established in 1947, cooperatives have helped the community, especially small and medium-sized communities in economic growth [1]. At first the activities in cooperatives only referred to the process of saving and borrowing activities, but over time the cooperative has developed other economic activities, such as the process of buying and selling to the community at relatively cheap and affordable prices. This has resulted in the strengthening of cooperatives and has had a positive economic development impact on the community. In addition, this makes the community more trust in cooperatives and feel calm in carrying out the savings and loan process in cooperatives. In the process of saving and lending, cooperative members can save in the cooperative and can also make loans with very small interest to build the desired business or business. From year to year, cooperatives always adapt to the development of science and technology. Including the use of information technology for the management and management of a cooperative. One of the cooperatives that has been using this technology since 2014 is the Kapur Warna Civil Servant Cooperative (KPN) which is located in the city of Padang and was founded in 1984. KPN Kapur Warna currently has 320 members and has various business fields in the form of routine and incidental businesses. Routine business is the main business of a cooperative which includes a savings and loan business unit and a convenience store (*Toserba*) business unit [2]. In the savings and loan business unit, members can borrow from the cooperative and pay in installments every month. Before a member can make a loan, the cooperative management must first verify the member to decide whether a member can borrow or not. The verification process is carried out through an interview process and looking at the background of the members so far. From this manual process problems arise, often the resulting decisions are of low quality and less valid due to subjective decision making and low level of analytical skills. This makes them vulnerable to errors in the lending process.

The role of decision makers is very important in determining which members are eligible to borrow from the cooperative. However, this is not easy because each decision maker has a different assessment of prospective borrowers so that it provides an opportunity to make different decisions.

To overcome the problems above, it is necessary to change the manual system to a system based on a decision support system to facilitate the verification process and also a system that can accommodate the decision-making process that can be done in groups is needed.

The decision support system utilizes the model subsystem to produce outputs in the form of ranking using quantitative methods. This can help decision makers in carrying out their duties. One of the methods used is Multi Attribute Decision Making (MADM) [3]. The most widely used methods are the Analytical Hierarchy Process (AHP) method and the Technique for Others Preference by Similarity to Ideal Solution (TOPSIS).

Several studies that have used the AHP and TOPSIS methods among them are in the selection of suppliers by a store owned by a cooperative. In this study, both methods were used to assist decision makers in making decisions about which supplier is suitable for supplying goods in the store [4]. This study also uses a group decision support system. Similar research also uses the same method, namely applying these two methods to the Prequalification of suppliers in the Construction Supply Chain [5].

Subsequent studies also used the AHP and TOPSIS methods, then added the SAW method in determining the extraction of renewable resources in Iran. The alternatives used are technical, economic, energy security and social aspects by using different sub-criteria [6].

Several studies using group decision support systems have also been developed. One of them is a study that describes changes in decision making when using the GDSS with the Borda method [7]. Another research that uses BORDA for GDSS is the design of a geographic-based decision support system for road repairs. This study aims to help the Department of Public Works to take a road repair and damage information system in Bandung district [8].

In this study, a combination of AHP and TOPSIS methods was used. The reason for this selection is because AHP has advantages in the pairwise matrix comparison process and there is a consistency analysis process to see whether the pairwise comparison is consistent or not. While the reason for choosing the TOPSIS method is because it is more practical, the simplicity of the concept, it is easy to understand and apply to various cases [9].

II. Material And Methods

Decision making is the process of selecting several available alternatives by the decision maker to get a result [10]. Based on the management hierarchy, decisions are divided into three categories, namely: (1) Strategic Decisions, namely decisions to respond to environmental challenges and changes that are usually long-term in nature, (2) Administrative/tactical decisions, namely decisions related to resource management. resources (financial, technical and personnel) and (3) Operational Decisions, namely decisions related to daily operational activities.

A. Decision Support System and Group Decision Support System

Systems that can assist decision makers by utilizing data and methods and models for solving unstructured problems are called decision support systems [11]. This decision support system is an interactive computer-based system. In the decision support system, there is a set of procedures in the form of a model that is used for data processing and assessment that helps management in decision making [12].

Decision support systems are possible to group. This system is incorporated in a group consisting of a computer-based system that is run by several people to support the work and tasks assigned to the system. This group of people have the same goals and suggestions so that by relating to each other [13]

B. AHP (Analytical Hierarchy Process) method

In general, the steps that must be taken in using the AHP method are as follows [14]:

1) Problem decomposition: In this first stage, the problems that have been found are broken down into elements in the form of a hierarchical decision-making process. The form of this hierarchical structure can be seen in Fig 1.

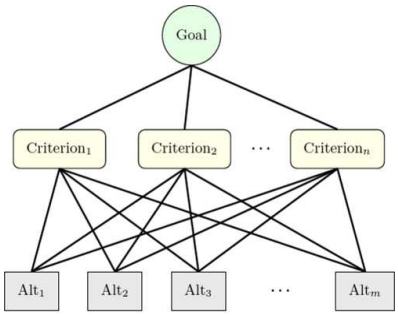

Fig. 1 AHP Hierarchy

The form of the hierarchical structure in the figure is, the first level is described as the goal, the second level is the criteria and the third level is the alternative. The problem hierarchy is used to assist the decision-making process in a system by taking into account all the decision elements involved.

2) Comparative judgement: At this stage, the priority of elements is determined by conducting pairwise comparisons between elements according to predetermined criteria.

TABLE I
THE COMPARISON SCALE OF PAIRWISE SAATY

Intensity of Importance	Description
1	Both elements are equally important
3	Elements of which one is slightly more important than the other
5	One element is more important than the other elements
7	One element is clearly more absolutely important than the other elements
9	One element is absolutely important than the other elements
2,4,6,8	Intermediate consideration values between two adjacent values

The results of the assessment will be shown in the form of a pairwise comparisons matrix, namely a pairwise comparison

matrix that contains the preference levels of several alternatives for each criterion. Table 1 shows that the preference scale used is a scale of 1 which indicates the lowest level (equal importance) to a scale of 9 which indicates the highest level (extreme importance).

3) Synthesis: The process carried out at this stage is to add up the values of each column in the matrix, then divide each value from the column by the total column in question to obtain the normalization of the matrix. Then, the values for each row are summed and divided by the number of elements to get the average value. It aims to obtain the overall priority of the considerations against pairwise comparisons.

4) Calculating lambda max (λmax): At this stage the consistency measurement is carried out by multiplying each value in the first column with the relative priority of the first element, the value in the second column with the relative priority of the second element and so on. Then do the sum of each row. The result of the row sum, divided by the element's relative priority. Next, the quotient is added with the number of elements that exist.

5) Calculate the Consistency Index (CI): The CI was calculated using the formula:

$$CI = (\lambda_{max} - n) / n \quad (1)$$

n is the number of elements.

6) Calculate Consistency Ratio (CR): The CR was calculated using the following formula:

$$CR = CI / RC \quad (2)$$

C is the Random Consistency index

7) Checking the consistency of the hierarchy: At this stage, if the consistency ratio value is more than 10% (0.1), then the judgment data assessment must be corrected because there is an inconsistency in determining the comparison, which allows AHP not to give a meaningful final result. However, if the consistency ratio value is less than or equal to 0.1 then the calculation results can be said to be correct.

C. TOPSIS Method (Technique for Others Preference by Similarity to Ideal Solution)

One of the methods used in multi-criteria decision support is TOPSIS, which was introduced by Yonn and Hwang. This method is widely used for multi criteria. In this method, there are considerations of positive ideal solutions and negative ideal solutions. These two solutions make the chosen alternative has the shortest distance to the positive ideal solution and the farthest distance to the negative ideal solution [6], [15]. The steps in the TOPSIS Method:

1) Normalize the decision matrix, that is, each element in the D matrix is normalized to get the R normalization matrix. Each normalization of the rij value can be done by the following calculation:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x^2{}_{ij}}}$$

$$R=\begin{bmatrix} r_{11} & r_{12} & r_{13} \dots r_{1n} \\ \dots & \dots & \dots \\ r_{m1} & r_{m2} & r_{m3 \dots} r_{mn} \end{bmatrix} \quad (3)$$

Where:

R : Normalized matrix
r_{ij} : Element value of normalized matrix
x_{ij} : Element value of each sub-criteria of each alternative
i : 1…m number of alternatives
j : 1…n number of subcriteria

2) Perform weighting on the normalized matrix: weighting on the normalized matrix was performed by assigning a weight W = $\{w_1, w_2, w_3, \dots, w_n\}$ so that the normalization of the weights of the V matrix can be produced as follows:

$$W = \{w_1, w_2, w_3, \dots, w_n\}$$

$$y_{ij} = w_j r_{ij}$$

$$Y=\begin{bmatrix} w_1 r_{11} & w_2 r_{12} & w_3 r_{13} \dots w_n r_{1n} \\ \dots & \dots & \dots \\ w_1 r_{m1} & w_2 r_{m2} & w_3 r_{m3} \dots w_4 r_{m4} \end{bmatrix} \quad (4)$$

Where:

Y : Weighted normalized matrix
y_{ij} : Element value of the weighted normalized matrix
w : The preference weight value of each sub-criteria obtained from AHP process
i : 1…m number of alternatives
j : 1…n number of subcriteria

3) Determine the ideal positive and negative ideal solutions, namely by denoted the positive ideal solution with A^+ and the negative ideal solution with A^-.

$$A+ = (y_1^+, y_2^+, \dots, y_n^+)$$

$$A- = (y_1^-, y_2^-, \dots, y_n^-)$$

Condition:

$$y_j^+ = \begin{cases} \max y_{ij} \; ; if \; j \; is \; profit \; attribute \\ \min y_{ij} \; ; if \; j \; is \; cost \; attribute \end{cases} \quad (5)$$

$$y_j^- = \begin{cases} \min y_{ij} \; ; if \; j \; is \; profit \; attribute \\ \max y_{ij} \; ; if \; j \; is \; cost \; attribute \end{cases} \quad (6)$$

Where:

A^+ : Positive ideal solution
A^- : Negative ideal solution
i : 1…m number of proposals
j : 1…n number of sub criteria

4) Calculating the separation measure, which is a measurement of the distance from an alternative to a positive ideal solution and a negative ideal solution. Alternative distance (D_I^+) with positive ideal solution is formulated in equation.

$$D_I^+ = \sqrt{\sum_{j=1}^{n} (y_J^+ - y_{ij})2} \quad (7)$$

Where:

i : 1…m number of alternatives
j : 1…n number of sub criteria

Alternative distance (D_I^-) with negative ideal solution is formulated in equation

$$D_I^- = \sqrt{\sum_{j=1}^{n}(y_J^- - y_{ij})2} \quad (8)$$

Where:

i : 1…m number of alternatives
j : 1…n number of sub criteria

5) Calculating the relative closeness to the positive ideal, which represents the relative closeness of alternative A+ to the ideal solution A- with the following formula:

$$Vi = \frac{D_i^-}{D_i^- + D_i^+} \quad (9)$$

Where:

i : 1,2,…,m → alternatives
D : distance alternative

1) Ordering the options, namely by ranking the alternatives based on the order of *Vi*, the best alternative is the one that has the shortest distance to the positive ideal solution and the farthest distance to the negative ideal solution.

D. BORDA

The principle of the Borda method is to rank the available alternatives [16]. The alternative that has the highest rank is given the highest score, and so on in descending order given a lower value for the rank below it until the lowest rank is given a value of 0 or 1. The idea of the Borda method is to require voters to rank each candidate and assign a value to each candidate. each rank [17]. For example, the first rank is given a value of 2, the second rank is given a value of 1 and the third rank is given a value of 0.

Another definition of Borda is a voting method used for group decision making for the selection of single winner or multiple winner [18]. Borda determines the winner by assigning a certain number of points to each alternative. Furthermore, the winner will be determined by the number of alternative points collected. In a group decision support system, one of the problems that is often faced is how to aggregate the opinions of decision makers to produce the right decisions.

TABLE II
DECISION MAKING WITH BORDA

Priority	DM1	DM2	DM3	Weight
1	Alternative 1	Alternative 1	Alternative 3	3
2	Alternative 2	Alternative 3	Alternative 2	2
3	Alternative 3	Alternative 2	Alternative 1	1

III. RESULT AND DISCUSSIONS

This group decision support system uses the AHP method to determine the weights. It is followed by the TOPSIS method to generate rankings by each decision maker, and finally, the Borda method is used to select the winner proposed by the decision maker.

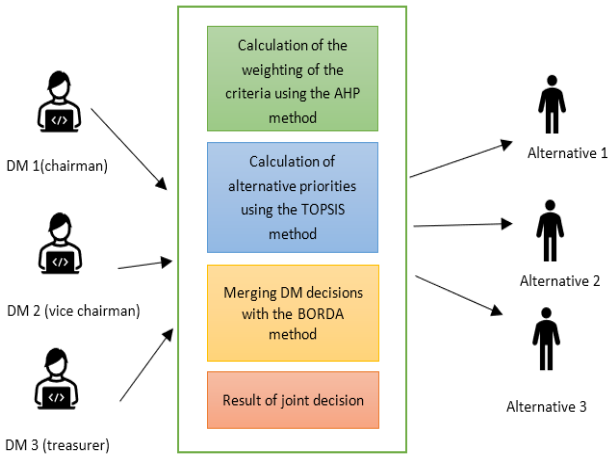

Fig. 2 Group Decision Support System Process Structure

In supporting the decision to grant a loan at KPN Kapur Warna, there are several criteria used. The criteria, sub-criteria and sub-criteria section can be seen in table III.

TABLE III
DECISION MAKING WITH BORDA SECTION AND WEIGHT OF INTEREST

No	Criteria		Sub-criteria	Sub-criteria section	Weight of Interest
1	Character (CHA)	a	Community Assessment	Good	5
				Enough	2
				Not Enough	0
		b	Family Member	1-3	10
				4-5	9
				6-7	8
				>= 7	5
2	Capacity CAP)	a	Occupations	Civil servant 4a-4d	10
				Civil servant 3a-3d	9
				Civil servant 2a-2d	8
				Civil servant 1a-1d	7
		b	Position	Chief	5
				Employee	3
3	Capital (CAP)	a	Monthly Income	> 5	10
				3-5 million	8
				1-2 million	7
				< 1 million	5
		b	Debt Elsewhere	Yes, Debt = Collateral Amount	1
				Yes, Debt < Collateral Amount	2
				No	10
4	Collateral (COL)	a	Document Proof of Motorcycle ownership (BPKB)	Car	10
				Motorcycle	5
		b	House	Permanent type > 70	10
				Permanent type 60-65	9
				Permanent type 50-54	8
				Permanent type 36-45	7
				Permanent type 25-29	6
				Permanent type 15-21	5
		c	Surface Area	> 500m	10
				400-500m	9
				300-400m	8
				200-300m	7
				100-200m	6
				50-100m	5
				<50m	0
5	Condition (CON)	a	Job Prospect	Good	5
				Enough	2
				Not Enough	0
		b	Ages	> 60 years or 20-40 years	2
				40 years - 50 years	4

A. AHP Calculation

In calculating the AHP, the first step that must be taken is to determine the priority of the criteria, namely by determining the pairwise comparison matrix for each criterion. The paired matrix for each criterion can be seen in the following table:

TABLE IV
CRITERIA PAIRED MATRIX

	CHA	CAY	CAP	COL	CON
CHA	1.00	2.00	2.00	2.00	4.00
CAY	0.50	1.00	3.00	3.00	3.00
CAP	0.50	0.50	1.00	3.00	2.00
COL	0.50	0.33	0.33	1.00	2.00
CON	0.25	0.33	0.50	0.50	1.00

The next step is to make a synthesis of the criteria matrix. The synthesis of the criteria matrix can be seen from the following table:

TABLE V
CRITERIA MATRIX SYNTHESIS

	CHA	CAY	CAP	COL	CON	Amount	Priority
CHA	0.36	0.48	0.29	0.21	0.33	1.68	**0.34**
CAY	0.18	0.24	0.44	0.32	0.25	1.43	**0.29**
CAP	0.18	0.12	0.15	0.32	0.17	0.93	**0.19**
COL	0.18	0.08	0.05	0.11	0.17	0.58	**0.12**
CON	0.09	0.08	0.07	0.05	0.08	0.38	**0.08**

The next step is to create a summation matrix for each row.

TABLE VI
THE ADDITION MATRIX OF EACH ROW

	CHA	CAY	CAP	COL	CON	Amount
CHA	0.34	0.57	0.37	0.23	0.30	1.82
CAY	0.17	0.29	0.56	0.35	0.23	1.59
CAP	0.17	0.14	0.19	0.35	0.15	1.00
COL	0.17	0.10	0.06	0.12	0.15	0.59
CON	0.08	0.10	0.09	0.06	0.08	0.41

Then, calculate the consistency ratio shown by the following table:

TABLE VII
CONSISTENCY RATIO

	Amount/Row	Priority	Result
CHA	1.82	0.34	2.15
CAY	1.59	0.29	1.87
CAP	1.00	0.19	1.18
COL	0.59	0.12	0.71
CON	0.41	0.08	0.48

With n=5, λ_{max} = 1,2807, we can get CI value -0.7439 and CR value - 0.6642. The CR value obtained is below 0.1 to accept the CR.

In the same way, the priority of each sub-criteria can be calculated. The results of each priority sub-criteria can be seen in the following table:

TABLE VIII
PRIORITY OF SUB-CRITERIA

No	Criteria	Priority		Sub-Criteria	Priority	AHP Weight
1	Character	**0.34**	a	Community Assessment	**0.67**	**0.22**
			b	Family Member	**0.33**	**0.11**
2	Capacity	**0.29**	a	Occupations	**0.83**	**0.24**
			b	Positions	**0.17**	**0.05**
3	Capital	**0.19**	a	Monthly Income	**0.67**	**0.12**
			b	Debt Elsewhere	**0.33**	**0.06**
4	Collateral	**0.12**	a	Document Proof of Motorcycle ownership (BPKP)	**0.48**	**0.06**
			b	House	**0.35**	**0.04**
			c	Surface Area	**0.17**	**0.02**
5	Condition	**0.08**	a	Job Prospect	**0.80**	**0.06**
			b	Age	**0.20**	**0.02**

B. Member Calculation

In this case, five members will be assessed on the lending. The assessment data from each member can be seen in Table IX. This assessment is carried out by one of the decision-makers.

TABLE IX
RATING OF EACH MEMBER

No	Criteria		Sub Criteria	A1	A2	A3	A4	A5
1	Character	a	Community Assessment	5.00	5.00	2.00	2.00	5.00
		b	Family Member	9.00	8.00	8.00	8.00	8.00
2	Capacity	a	Occupations	6.00	7.00	8.00	9.00	8.00
		b	Positions	3.00	3.00	3.00	5.00	5.00
3	Capital	a	Monthly Income	10.00	8.00	5.00	7.00	8.00
		b	Debt Elsewhere	10.00	2.00	1.00	2.00	10.00
4	Collateral	a	Document Proof of Motorcycle ownership (BPKP)	10.00	10.00	5.00	5.00	5.00
		b	House	9.00	8.00	10.00	7.00	5.00
		c	Surface Area	10.00	9.00	8.00	7.00	5.00
5	Condition	a	Job Prospect	5.00	5.00	5.00	2.00	2.00
		b	Age	2.00	2.00	4.00	4.00	2.00

C. TOPSIS Method Calculation

To perform the TOPSIS calculation, the weights for each sub-criterion are first determined. The following table shows the weight of each sub-criteria. This weight is obtained from the AHP calculation process that has been carried out.

TABLE X
THE WEIGHT OF EACH SUB-CRITERIA OBTAINED FROM THE CALCULATION OF AHP

Sub- Criteria	AHP Weight
Community Assessment	**0.22**
Family Member	**0.11**
Occupations	**0.24**
Positions	**0.05**
Monthly Income	**0.12**
Debt Elsewhere	**0.06**
Document Proof of Motorcycle ownership (BPKP)	**0.06**
House	**0.04**
Surface Area	**0.02**
Job Prospect	**0.06**

Furthermore, the calculation of the quadratic benefit of each sub-criteria for all members is as follows:

TABLE XI
BENEFIT SUB-CRITERIA SQUARE

Sub Criteria	Quadratic
Community Assessment	9.53
Family Member	28.26
Occupations	25.35
Positions	25.29
Monthly Income	17.86
Debt Elsewhere	23.45
Document Proof of Motorcycle ownership (BPKP)	25.29
House	21.56
Surface Area	11.70

TABLE XII
DISTANCE VALUE OF POSITIVE AND NEGATIVE IDEAL SOLUTIONS

Member	Positive Ideal Solution	Negative Ideal Solution
A1	0.04	0.09
A2	0.05	0.08
A3	0.09	0.04
A4	0.09	0.05
A5	0.04	0.09

The normalized value for R in each sub-criterion is obtained as follows:

TABLE XIII
NORMALIZATION MATRIX R

Criteria	CHARACTER		CAPACITY		CAPITAL		COLLATERAL			CONDITION	
	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits
Member	a	b	a	b	a	b	a	b	c	a	b
A1	5.00	9.00	6.00	3.00	10.00	10.00	10.00	9.00	10.00	5.00	2.00
A2	5.00	8.00	7.00	3.00	8.00	2.00	10.00	8.00	9.00	5.00	2.00
A3	2.00	8.00	8.00	3.00	5.00	1.00	5.00	10.00	8.00	5.00	4.00
A4	2.00	8.00	9.00	5.00	7.00	2.00	5.00	7.00	7.00	2.00	4.00
A5	5.00	8.00	8.00	5.00	8.00	10.00	5.00	5.00	5.00	2.00	2.00

TABLE XIV
WEIGHTED NORMALIZATION MATRIX

Criteria	CHARACTER		CAPACITY		CAPITAL		COLLATERAL			CONDITION	
	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits
Member	a	b	a	b	a	b	a	b	c	a	b
A1	0.12	0.05	0.08	0.01	0.07	0.04	0.03	0.02	0.01	0.03	0.00
A2	0.12	0.04	0.09	0.01	0.05	0.00	0.03	0.01	0.01	0.03	0.00
A3	0.04	0.04	0.11	0.01	0.03	0.00	0.01	0.02	0.00	0.03	0.00
A4	0.04	0.04	0.12	0.02	0.05	0.00	0.01	0.01	0.00	0.01	0.00
A5	0.12	0.04	0.11	0.02	0.05	0.04	0.01	0.01	0.0	0.01	0.00

TABLE XV
POSITIVE AND NEGATIVE IDEAL SOLUTIONS

Criteria	CHARACTER		CAPACITY		CAPITAL		COLLATERAL			CONDITION	
	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits
Member	a	b	a	b	a	b	a	b	c	a	b
Positive Ideal Solution	0.12	0.05	0.12	0.03	0.07	0.04	0.03	0.02	0.01	0.03	0.01
Negative Ideal Solution	0.05	0.05	0.08	0.01	0.03	0.00	0.02	0.01	0.01	0.01	0.01

From the results of calculating the separation measure, which is a measurement of the distance from an alternative to a positive ideal solution and a negative ideal solution, it can be calculated relative proximity to the positive ideal and relative closeness to the negative ideal, which is then used to sort the options by ranking the alternatives.

The value in Table XVI shows that A5 is the member who has the highest preference value so that this member is the most entitled to receive a loan from the cooperative. Furthermore, it can be calculated in the same way for the results of each assessment from the decision-maker, namely the Chairman of the Cooperative, Deputy Chairman of the Cooperative, and the Treasurer of the cooperative.

TABLE XVI
PREFERENCE VALUE

Member	Preference Value
A1	0.68
A2	0.63
A3	0.27
A4	0.34
A5	0.72

So that different evaluation results are obtained from each decision-maker, such as the following sample table:

TABLE XVII
DECISION MAKER EVALUATION RESULTS

Rank	DM1 Chairman	DM2 Vice Chairman	DM3 Treasure
1	A5	A5	A1
2	A1	A2	A5
3	A2	A1	A2
4	A4	A4	A4
5	A3	A3	A3

D. BORDA Method Calculation

After obtaining the ranking for each decision-maker, the next step is to calculate the voting BORDA to combine the assessments of the different decision-makers. The calculation of the number of values was done by calculating the number of weight values from each alternative which can be seen in the following table:

TABLE XVIII
BORDA CALCULATIONS

Rank	DM1 Chairman	DM2 Vice-Chairman	DM3 Treasure	Weight
1	A5	A5	A1	5
2	A1	A2	A5	4
3	A2	A1	A2	3
4	A4	A4	A4	2
5	A3	A3	A3	1

After getting the Borda calculation value from each decision-maker, then proceed with the Borda voting results, which can be seen in the following table:

TABLE XIV
VOTING BORDA RESULTS

Alternative	DM1 Chairman	DM2 Vice-Chairman	DM3 Treasure	Score
A1	4	3	5	12
A2	3	4	3	10
A3	1	1	1	3
A4	2	2	2	6
A5	5	5	4	14

From the results of the calculation of Table XIV using the Borda method, an alternative is obtained for members who are entitled to a loan. A5 is a member who is the most entitled to a loan with the highest score of 14. The alternative rank order by each decision maker affects the final result in the Borda calculation.

IV. CONCLUSION

Several conclusions were obtained based on the analysis and discussion conducted during the study. First, with the existence of this decision support system, it can standardize the references in making decisions regarding the determination of lending to cooperatives. Second, by combining the AHP and TOPSIS methods used in this decision support system, it has been implemented and succeeded in accordance with the expected goals.

Second, the application of the AHP method in this system aims to obtain the weight value of each criterion taken from the pairwise comparison matrix. While the TOPSIS method is used in determining cooperative members who get priority to get borrowed funds from cooperatives. The purpose of combining AHP and TOPSIS methods is to reduce TOPSIS's own weakness in giving weights, which is subjective.

Third, the use of the Borda method is able to unify every decision made by each decision-maker because it can produce individual decisions based on the results of ranking alternatives in each decision support system. The alternative with the largest preference value in each DSS becomes the group decision alternative.

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